

Appl. No. : 09/870,619  
Filed : May 31, 2001

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 37 and 41 have been amended.

Listing of Claims:

1. (Previously presented) An internal combustion engine for an outboard motor comprising at least one combustion chamber formed by at least a engine body, a cylinder head assembly and a piston that moves relative to the engine body and the cylinder head assembly, a crankshaft that extends in a generally vertical direction and is coupled to the piston such that movement of the piston causes the crankshaft to rotate, a port that is communication with the combustion chamber, a valve moveable between open and closed positions of the port, a camshaft that is journaled for rotation and extends generally parallel to the crankshaft, the camshaft including at least one cam configured to open and close the valve, a rotor attached an upper end of the camshaft and being positioned for at least partial rotation within a housing, the rotor defining at least a first space and a second space within said housing, a driven member coupled to the housing, a drive member coupled to an upper end of the output shaft, the drive member coupled to the driven member such that rotation of the drive member is transmitted to the driven member, a control valve positioned within a common hydraulic passage having a first opening and a second opening, and a first hydraulic passage and a second hydraulic passage, the first hydraulic passage in communication with the first space and the first opening and the second hydraulic passage in communication with the second space and second opening, the control valve being configured to selectively open and close the first and second openings such that hydraulic fluid is selectively supplied to either the first space or the second space, the control valve also being positioned generally along an axis that is perpendicular to the camshaft, and a bearing cap located near an upper end of the camshaft, the bearing cap configured to cooperate with the cylinder head assembly so as to support the camshaft for rotation and at least a portion of the common hydraulic passage being formed in the bearing cap.

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2. **(Original)** An engine as in Claim 1, wherein the control valve is also positioned generally along an axis that extends transversely across the engine.

3. **(Original)** An engine as in Claim 1, wherein the control valve is positioned near an upper end of the camshaft.

4. **(Cancelled)**

5. **(Previously presented)** An engine as in Claim 1, wherein at least a portion of the first hydraulic passage and second hydraulic passage are formed in the bearing cap.

6. **(Original)** An engine as in Claim 5, wherein the port is an intake port, the valve is an intake valve and the camshaft is an intake camshaft.

7. **(Original)** An engine as in Claim 6, further comprising an exhaust port, an exhaust valve and an exhaust camshaft that extends generally parallel to the intake camshaft, wherein the bearing cap is also configured to cooperate with the cylinder head assembly to support the exhaust camshaft for rotation, the bearing cap having a single integral body.

8. **(Previously presented)** An engine as in Claim 1, further comprising a cylinder head cover and wherein the control valve extends through an opening in the cylinder head cover.

9. **(Original)** An engine as in Claim 8, wherein the opening in the head cover includes a lip and a sealing member positioned between the lip and the control valve.

10. **(Original)** An engine as in Claim 1, further comprising a lubrication system and lubrication passages, the lubrication passages including a supply passage that is in communication with the common passage.

11. **(Original)** An engine as in Claim 10, wherein the supply passage is defined, at least in part, in the cylinder head assembly.

12. **(Previously presented)** An internal combustion engine for an outboard motor comprising at least one combustion chamber formed by at least a engine body, a cylinder head assembly and a piston that moves relative to the engine body and the cylinder head assembly, a crankshaft that extends in a generally vertical direction and is coupled to the piston such that movement of the piston causes the crankshaft to rotate, a port that is communication with the combustion chamber, a valve moveable between open and closed positions of the port, a camshaft that is journaled for rotation and extends generally parallel to the crankshaft, the

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camshaft including at least one cam configured to open and close the valve, a rotor attached an upper end of the camshaft and being positioned for at least partial rotation within a housing, the rotor defining at least a first space and a second space within said housing, a driven member coupled to the housing, a drive member coupled to an upper end of the output shaft, the drive member coupled to the driven member such that rotation of the drive member is transmitted to the driven member, a control valve positioned within a common hydraulic passage having a first opening and a second opening, and a first hydraulic passage and a second hydraulic passage, the first hydraulic passage in communication with the first space and the first opening and the second hydraulic passage in communication with the second space and second opening, the control valve being configured to selectively open and close the first and second openings such that hydraulic fluid is selectively supplied to either the first space or the second space, the control valve also being positioned generally along an axis that is perpendicular to the camshaft, the engine further comprising a lubrication system and lubrication passages, the lubrication passages including a supply passage that is in communication with the common passage, wherein the supply passage is defined, at least in part, in the cylinder head assembly and a bearing cap that is located near an upper end of the camshaft, the bearing cap configured to cooperate with the cylinder head assembly so as to support the camshaft for rotation.

13. (Original) An engine as in Claim 12, further in including a filter positioned in the supply passage.

14. (Original) An engine as in Claim 13, wherein the filter is positioned in a filter bore that has an opening on a contact face between the cylinder head assembly and the bearing cap.

15. (Original) An engine as in Claim 14, wherein the filter is positioned in the bearing cap.

16. (Original) An engine as in Claim 14, wherein the filter is positioned in the cylinder head assembly.

17. (Original) An engine as in Claim 1, wherein the port in an intake port, the valve is an intake valve and the camshaft is an intake camshaft.

18. (Original) An engine as in Claim 1, wherein the port in an exhaust port, the valve in an exhaust valve and the camshaft is an exhaust camshaft.

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19. (Previously presented) An internal combustion engine for an outboard motor comprising at least one combustion chamber formed by at least a engine body, a cylinder head assembly and a piston that moves relative to the engine body and the cylinder head assembly, a crankshaft that extends in a generally vertical direction and is coupled to the piston such that movement of the piston causes the crankshaft to rotate, a port that is communication with the combustion chamber, a valve moveable between open and closed positions of the port, a camshaft that is journaled for rotation and extends generally parallel to the crankshaft, the camshaft including at least one cam configured to open and close the valve, a rotor attached an upper end of the camshaft and being positioned for at least partial rotation within a housing, the rotor defining at least a first space and a second space within said housing, a driven member coupled to the housing, a drive member coupled to an upper end of the output shaft, the drive member coupled to the driven member such that rotation of the drive member is transmitted to the driven member, a control valve positioned within a common hydraulic passage having a first opening and a second opening, and a first hydraulic passage and a second hydraulic passage, the first hydraulic passage in communication with the first space and the first opening and the second hydraulic passage in communication with the second space and the second opening, the control valve being configured to selectively open and close the first and second openings such that hydraulic fluid is selectively supplied to either the first space or the second space, the first and second openings being positioned generally at a common engine elevation, and a lubrication system and lubrication passages, the lubrication passages including a supply passage that is in communication with the common passage, wherein the supply passage is defined, at least in part in a bearing cap that is located near an upper end of the camshaft, the bearing cap configured to cooperate with the cylinder head assembly so as to support the camshaft for rotation.

20. (Canceled)

21. (Original) An engine as in Claim 19, wherein the control valve is positioned near an upper end of the camshaft.

22. (Canceled)

23. (Previously presented) An engine as in Claim 19, wherein at least a portion of the first hydraulic passage and second hydraulic passage are formed in the bearing cap.

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24. (Original) An engine as in Claim 23, wherein the port is an intake port, the valve is an intake valve, and the camshaft is an intake camshaft.

25. (Original) An engine as in Claim 24, further comprising an exhaust port, an exhaust valve and an exhaust camshaft that extends generally parallel to the intake camshaft, wherein the bearing cap is also configured to cooperate with the cylinder head assembly to support the exhaust camshaft for rotation, the bearing cap having a single integral body.

26. (Previously presented) An engine as in Claim 19, further comprising a cylinder head cover and wherein the control valve extends through an opening in the cylinder head cover.

27. (Original) An engine as in Claim 26, wherein the opening in the head cover includes a lip and a sealing member positioned between the lip and the control valve.

28. (Canceled)

29. (Canceled)

30. (Previously presented) An internal combustion engine for an outboard motor comprising at least one combustion chamber formed by at least a engine body, a cylinder head assembly and a piston that moves relative to the engine body and the cylinder head assembly, a crankshaft that extends in a generally vertical direction and is coupled to the piston such that movement of the piston causes the crankshaft to rotate, a port that is communication with the combustion chamber, a valve moveable between open and closed positions of the port, a camshaft that is journaled for rotation and extends generally parallel to the crankshaft, the camshaft including at least one cam configured to open and close the valve, a rotor attached an upper end of the camshaft and being positioned for at least partial rotation within a housing, the rotor defining at least a first space and a second space within said housing, a driven member coupled to the housing, a drive member coupled to an upper end of the output shaft, the drive member coupled to the driven member such that rotation of the drive member is transmitted to the driven member, a control valve positioned within a common hydraulic passage having a first opening and a second opening, and a first hydraulic passage and a second hydraulic passage, the first hydraulic passage in communication with the first space and the first opening and the second hydraulic passage in communication with the second space and the second opening, the control valve being configured to selectively open and close the first and second openings such that

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hydraulic fluid is selectively supplied to either the first space or the second space, the first and second openings being positioned generally at a common engine elevation, the engine further comprising a lubrication system and lubrication passages, the lubrication passages including a supply passage that is in communication with the common passage wherein the supply passage is defined, at least in part, in the cylinder head assembly and a bearing cap that is located near an upper end of the camshaft, the bearing cap configured to cooperate with the cylinder head assembly so as to support the camshaft for rotation.

31. (Previously presented) An engine as in Claim 19, further in including a filter positioned in the supply passage.

32. (Original) An engine as in Claim 31, wherein the filter is positioned in a filter bore that has an opening on a contact face between the cylinder head assembly and the bearing cap.

33. (Original) An engine as in Claim 32, wherein the filter is positioned in the bearing cap.

34. (Original) An engine as in Claim 32, wherein the filter is positioned in the cylinder head assembly.

35. (Original) An engine as in Claim 19, wherein the port in an intake port, the valve is an intake valve and the camshaft is an intake camshaft.

36. (Original) An engine as in Claim 19, wherein the port in an exhaust port, the valve in an exhaust valve and the camshaft is an exhaust camshaft.

37. (Currently amended) An internal combustion engine for an outboard motor comprising an engine body, a piston movable relative to the engine body, a crankshaft that extends in a generally vertical direction and is journaled for rotation by the piston, the engine body, the piston and a cylinder head assembly together defining a combustion chamber, a port in communication with the combustion chamber, a valve movable between open and closed positions of the port, a camshaft that extends generally parallel to the crankshaft and is journaled for rotation to actuate the valve in a set angular position, a variable valve timing mechanism arranged to set the camshaft to an angular position between a first angular position and a second angular portion, the first angular position being advanced as compared to the second angular position, the variable valve timing mechanism comprising a setting section, a supply section and

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a control section, the control section comprising a control valve that is disposed on along an axis that is generally perpendicular to the camshaft, the supply section comprising a first hydraulic passage and a second hydraulic passage that are in hydraulic communication with the setting section and the control section, the first hydraulic passage and the second hydraulic passage not extending below a generally horizontal plane that lies normal to the axis of the camshaft and that contains a central axis that extends through the control valve, wherein the valve is positioned below the generally horizontal plane and the setting section is positioned above the generally horizontal plane.

38. (Original) An engine as in Claim 37, wherein the control valve is also positioned generally along an axis that extends transversely across the engine.

39. (Original) An engine as in Claim 37, wherein the control valve is positioned near an upper end of the camshaft.

40. (Original) An engine as in Claim 37, further comprising a bearing cap located near an upper end of the camshaft, the bearing cap configured to cooperate with the cylinder head assembly so as to support the camshaft for rotation.

41. (Currently amended) ~~An internal combustion engine for an outboard motor comprising an engine body, a piston movable relative to the engine body, a crankshaft that extends in a generally vertical direction and is journaled for rotation by the piston, the engine body, the piston and a cylinder head assembly together defining a combustion chamber, a port in communication with the combustion chamber, a valve movable between open and closed positions of the port, a camshaft that extends generally parallel to the crankshaft and is journaled for rotation to actuate the valve in a set angular position, a variable valve timing mechanism arranged to set the camshaft to an angular position between a first angular position and a second angular position, the first angular position being advanced as compared to the second angular position, the variable valve timing mechanism comprising a setting section, a supply section and a control section, the control section comprising a control valve that is disposed on along an axis that is generally perpendicular to the camshaft, the supply section comprising a first hydraulic passage and a second hydraulic passage that are in hydraulic communication with the setting section and the control section, the first hydraulic passage and the second hydraulic passage not~~

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~~extending through a generally horizontal plane that contains a central axis that extends through the control valve, further comprising a bearing cap located near an upper end of the camshaft, the bearing cap configured to cooperate with the cylinder head assembly so as to support the camshaft for rotation An engine as in Claim 40, wherein at least a portion of the first hydraulic passage and second hydraulic passage are formed in the bearing cap.~~

42. (Original) An engine as in Claim 41, wherein the port is an intake port, the valve is an intake valve, and the camshaft is an intake camshaft.

43. (Original) An engine as in Claim 42, further comprising an exhaust port, an exhaust valve and an exhaust camshaft that extends generally parallel to the intake camshaft, wherein the bearing cap is also configured to cooperate with the cylinder head assembly to support the exhaust camshaft for rotation, the bearing cap having a single integral body.

44. (Original) An engine as in Claim 40, further comprising a cylinder head cover and wherein the control valve extends through an opening in the cylinder head cover.

45. (Original) An engine as in Claim 44, wherein the opening in the head cover includes a lip and a sealing member positioned between the lip and the control valve.

46. (Previously presented) An engine as in Claim 37, further comprising a lubrication system and lubrication passages, the lubrication passages including a supply passage that is in communication with the control section.

47. (Original) An engine as in Claim 46, wherein the supply passage is defined, at least in part, in the cylinder head assembly.

48. (Previously presented) An internal combustion engine for an outboard motor comprising an engine body, a piston movable relative to the engine body, a crankshaft that extends in a generally vertical direction and is journaled for rotation by the piston, the engine body, the piston and a cylinder head assembly together defining a combustion chamber, a port in communication with the combustion chamber, a valve movable between open and closed positions of the port, a camshaft that extends generally parallel to the crankshaft and is journaled for rotation to actuate the valve in a set angular position, a variable valve timing mechanism arranged to set the camshaft to an angular position between a first angular position and a second angular portion, the first angular position being advanced as compared to the second angular

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position, the variable valve timing mechanism comprising a setting section-, a supply section and a control section, the control section comprising a control valve that is disposed on along an axis that is generally perpendicular to the camshaft, the supply section comprising a first hydraulic passage and a second hydraulic passage that are in hydraulic communication with the variable valve timing mechanism, the engine further comprising a lubrication system and lubrication passages, the lubrication passages including a supply passage that is in communication with the control section wherein the supply passage is defined, at least in part, in the cylinder head assembly and a bearing cap that is located near an upper end of the camshaft, the bearing cap configured to cooperate with the cylinder head assembly so as to support the camshaft for rotation.

49. (Original) An engine as in Claim 48, further in including a filter positioned in the supply passage.

50. (Original) An engine as in Claim 49, wherein the filter is positioned in a filter bore that has an opening on a contact face between the cylinder head assembly and the bearing cap.

51. (Original) An engine as in Claim 50, wherein the filter is positioned in the bearing cap.

52. (Original) An engine as in Claim 50, wherein the filter is positioned in the cylinder head assembly.

53. (Original) An engine as in Claim 37, wherein the port in an intake port, the valve is an intake valve and the camshaft is an intake camshaft.

54. (Original) An engine as in Claim 37, wherein the port in an exhaust port, the valve in an exhaust valve and the camshaft is an exhaust camshaft.

55. (Previously presented) An internal combustion engine for an outboard motor comprising at least one combustion chamber formed by at least a engine body, a cylinder head assembly and a piston that moves relative to the engine body and the cylinder head assembly, a crankshaft that extends in a generally vertical direction and is coupled to the piston such that movement of the piston causes the crankshaft to rotate, a port that is communication with the combustion chamber, a valve moveable between open and closed positions of the port, a camshaft that is journaled for rotation and extends generally parallel to the crankshaft, the camshaft including at least one cam configured to open and close the valve, a rotor attached an

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upper end of the camshaft and being positioned for at least partial rotation within a housing, the rotor defining at least a first space and a second space within said housing, a driven member coupled to the housing, a drive member coupled to an upper end of the output shaft, the drive member coupled to the driven member such that rotation of the drive member is transmitted to the driven member, a control valve positioned within a common hydraulic passage having a first opening and a second opening, and a first hydraulic passage and a second hydraulic passage, the first hydraulic passage in communication with the first space and the first opening and the second hydraulic passage in communication with the second space and second opening, the control valve being comprising an actuator portion and a valve portion, the control valve configured to selectively open and close the first and second openings such that hydraulic fluid is selectively supplied to either the first space or the second space, and a cylinder head cover, the valve portion of the control valve lying within the cylinder head cover.

56. (Previously presented) The engine of Claim 55, wherein the actuator portion of the control valve extends at least partially through an opening in the cylinder head cover.

57. (Previously presented) The engine of Claim 56, wherein the control valve lies on a side of the camshaft opposite of the valve.

58. (Previously presented) The engine of Claim 56, wherein the control valve lies below a substantially horizontal plane which extends through at least a portion of the setting section of the variable valve timing mechanism.

59. (Previously presented) The engine of Claim 58, wherein camshaft includes a plurality of cams for actuating valves, and the control valve of the variable valve timing mechanism lies above a generally horizontal plane that extends through an uppermost valve.